

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

10th November 2014

Subject ST5 - Finance and Investment A

Time allowed: Three hours (14.45* – 18.00 Hrs.)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. *Please read the instructions on the front page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception.*
2. ** You have 15 minutes at the start of the examination in which you are required to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the answer sheet until instructed to do so by the supervisor.*
4. *The answers are not expected to be any country or jurisdiction specific. However, if Examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*
5. *Attempt all questions, beginning your answer to each question on a separate sheet.*
6. *Mark allocations are shown in brackets.*
7. *Please check if you have received complete Question Paper and no page is missing. If so, kindly get new set of Question Paper from the Invigilator.*

AT THE END OF THE EXAMINATION

Please return your answer book and this question paper to the supervisor separately.

- Q. 1)** Your client holds a big Portfolio of Stocks spread across various sizes of companies and from different business.
- i)** What is diversification? (1)
 - ii)** When does diversification fail? (2)
 - iii)** When does diversification work? (1)
 - iv)** What are the usual strategies adopted by fund managers to protect the portfolio? (3)
[7]
- Q. 2)**
- i)** Define Risk and uncertainty (3)
 - ii)** Your client holds 5 CDOs and each has probability of default of 5%. Out of these 5 different possible portfolios needs to be created, namely, Alpha, Beta, Gamma, Theta and Epsilon. Alpha is least risky and defaults only if all 5 CDOs fail and Epsilon is the riskiest and defaults if anyone of 5 defaults. Similarly Beta for any four defaults, Gamma for any three defaults and Theta for any 2 mortgage defaults. Create a matrix of default probability of the 5 possible portfolios assuming the each CDO default are correlated and also if perfectly uncorrelated. Finally find the risk multiple for each between uncorrelated and correlated. Explain the outcome and draw conclusion. (12)
[15]
- Q. 3)** Explain how an investor can use derivative contracts to effect a rapid switch from domestic equities to domestic long-dated fixed interest stocks, without carrying out rapid transactions in the underlying securities. (4)
- Q. 4)**
- i)** Explain the insight yielded by prospect theory into decision making by individuals. (6)
 - ii)** Compare and contrast the strategies to take a position on volatility using a straddle and using index 'Vix futures' (6)
[12]
- Q. 5)** A Fund Manager manages a portfolio of 250 Crores invested in Indian Equities. The benchmark index is NIFTY and the portfolio Beta is 1.5. The portfolio dividend yield is 2% compared to 1% for the NIFTY. The risk free rate is 9%. The Fund Manager wants to buy insurance against a reduction of more than 5% in the value of the portfolio over the next 6 months. An investment bank is willing to provide the required option of required strike over the counter. The current level of NIFTY is 8000 and an at-the-money one month call option on the NIFTY is priced at 175 per option.
- i)** If the pricing offered by the investment bank for the put option is based on the Black-Scholes formula, what will be the estimated cost of the insurance? (10)
 - ii)** If the protection is to be done using a 9 month index future rather than the OTC option, what needs to be done? (5)
- Ignore transaction costs. Make appropriate and reasonable assumptions wherever needed and state them clearly. [15]

- Q. 6)** Acquirer Ltd. is evaluating an opportunity to acquire its rival Target Ltd. which is an unlisted company that has run into a lot of problems of late. You are a finance actuary with an investment bank and your firm has got the mandate to approach Target management. Your senior officer would like to have a rough cut initial valuation of Target. He has suggested to you that using Merton Model maybe a better approach to evaluate Target.

You have gathered the following information

- Target reported sales of 950 Crores, EBITDA of 300 Crores and PAT of 35 Crores in recently ended financial year
- Target has a negative net worth of 350 Crores
- The following debt instruments are there in Target's balance sheet
ZCB of face value 1000 Crores to be redeemed after 4 years are trading at 66 per 100 par. 5 year debentures of face value 1000 Crores with 10% coupon payable annually. Yield curve maybe assumed as flat for the company's securities.
- Acquirer is a listed company whose stock returns have an annualized volatility of 20%, bond returns have an annualized volatility of 10% and correlation between them being 0.3. Acquirer has a debt to equity ratio of 0.3.
- The recent deals in the sector have happened at an average Enterprise Value to EBITDA multiple of 6X.
- The G-Sec rates are follows

6 months	8.59%
1 year	8.65%
2 year	8.46%
3 year	8.43%
4 year	8.58%
5 year	8.62%

- i) Explain the Merton model for valuation of a stock (4)
- ii) Please explain, why do you think the Merton model is probably a good method to value Target's equity? (3)
- iii) Arrive at the Merton model based value of the stock of Target (12)
- iv) You have read somewhere that this model is particularly useful in valuing CDS – Explain (3)
- v) Do you think this model can be used for valuation of General Insurance companies – Explain (3)

Ignore taxes. Make reasonable assumptions wherever necessary and state them clearly. [25]

- Q. 7)** You are a recently qualified investment actuary working in an investment consultancy. Your firm has got an assignment from the trustees of a Fund of Funds. The trustees would like to know how to measure the overall riskiness of the portfolio based on VaR analysis and how much each position is contributing to the total VaR. While you are comfortable in calculating the portfolio VaR, you are wondering how to allocate the VaR among the individual positions. Your senior officer tells you that since Beta is a proxy for risk you may allocate the VaR based on Beta of each position with respect to the portfolio. The following is the information you have gathered

Asset	Size (Billion INR)	Annualised volatility of asset returns
A	5	5%
B	4	15%
C	6	12%

The correlation matrix is as follows

	A	B	C
A	1	0.8	0.6
B		1	0.4
C			1

- i) Calculate the overall portfolio VaR and quantify the benefits of diversification if any. You may assume a confidence level of 95% (4+4)
- ii) Allocate the portfolio VaR among the three positions based on the method suggested by your senior officer (8)
- iii) Use the following data for the purpose of this sub-section alone. The expected excess returns (over risk free rate) from the three positions are as follows

A	5%
B	17%
C	12%

Please explain, why do you think the portfolio allocation is optimal?

Using the principles of CAPM outline an approach to optimize the portfolio (6)

Make suitable assumptions and state them clearly. [22]
